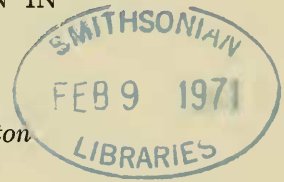


PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

HENICOXIPHIMUM REDACTUM, A NEW CYCLOPOID
COPEPOD ASSOCIATED WITH AN ASCIDIAN IN
FLORIDA AND NORTH CAROLINA

BY PAUL L. ILLG AND ARTHUR G. HUMES

*Department of Zoology, University of Washington
Seattle, Washington, and
Department of Biology, Boston University
Boston, Massachusetts*



The new copepod described below lives in the pharynx of a simple ascidian. The specimens studied comprise several collections made chiefly by H. J. Humm in Florida and one collection made by W. H. Sutcliffe, Jr., in North Carolina. These collections were originally deposited in the Smithsonian Institution.

The study of the material has been aided by grants to the authors from the National Science Foundation (GB-6474X; GB-8381X).

All figures have been drawn with the aid of a camera lucida. The letter after the explanation of each figure refers to the scale at which it was drawn. The abbreviations used are: A_1 = first antenna, A_2 = second antenna, L = labrum, MD = mandible, MX_1 = first maxilla, MX_2 = second maxilla, MXP = maxilliped, and P_1 = leg 1.

LICHOMOLGIDAE KOSSMANN, 1877

Henicoxiphium new genus

Body elongated cyclopiform. First antenna 7-segmented, formula in female: 4, 13, 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete (in male with one aesthete added on second segment and one on fourth segment). Second antenna 3-segmented, terminally with one claw and a clawlike element. Mandible slender, without indentation; lash with a row of spinules on concave side and numerous spinules on convex side.

First maxilla with three elements. Second maxilla 2-segmented. Maxilliped in female 3-segmented; in male 4-segmented, if proximal part of claw is regarded as a fourth segment.

Legs 1-4 with 3-segmented rami. Last segment of exopod of leg 4 with II, I, 5. Endopod of leg 4 with 0-1; 0-1; I. Leg 5 with a free segment bearing two unequal setae.

Other features as in the species described below.

Associated with ascidians.

Type species: Henicoxiphium redactum new species.

Gender neuter.

Etymology: The generic name is a combination of *ἐνικός* = single and *ξίφιον* (a diminutive of *ξίφος*) = a small straight sword, in allusion to the single swordlike spine on the third segment of the endopod of leg 4.

Henicoxiphium redactum new genus, new species

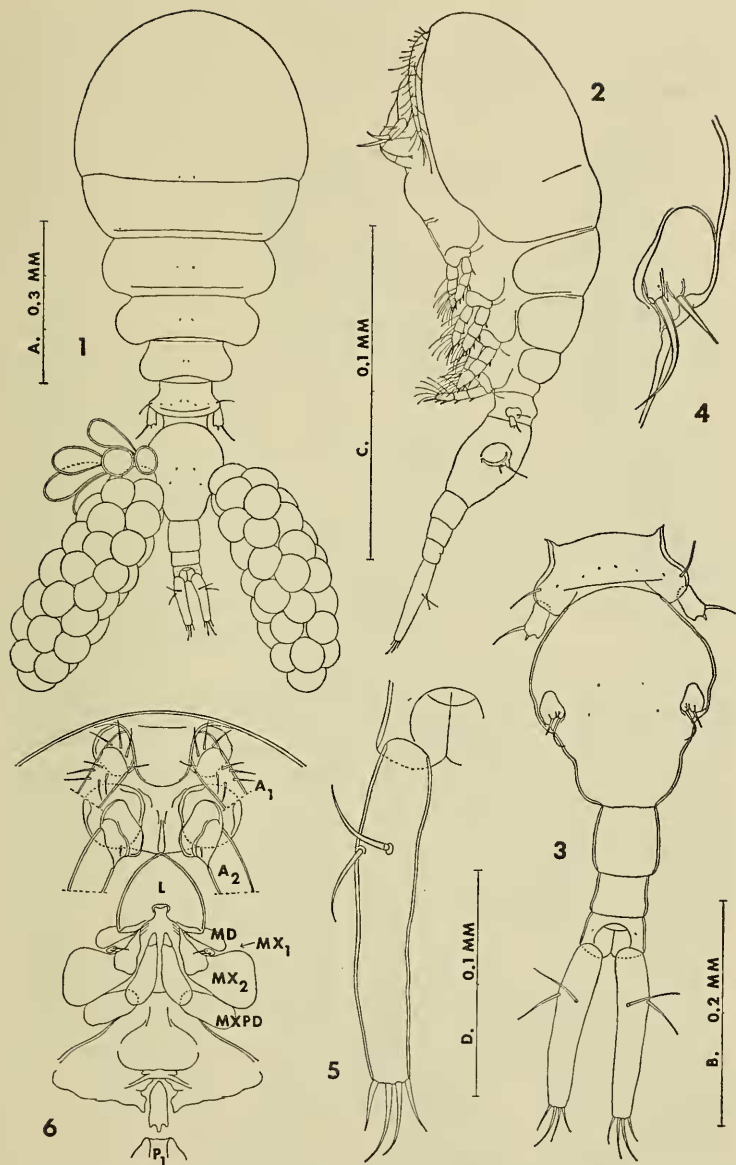
Figures 1-26

Type material: 191 ♀♀, 152 ♂♂, and 77 copepodids from the pharynx of approximately 75 ascidians, *Styela plicata* (Lesueur), Lemon Bay (near inlet), Englewood, Florida, 13 May 1950, collected by H. J. Humm (USNM Acc. No. 186261). Holotype ♀, allotype, and 275 paratypes (157 ♀♀, 118 ♂♂) deposited in the Smithsonian Institution, Washington; 20 paratypes (10 ♀♀, 10 ♂♂) in the Zoologisch Museum, Amsterdam; and the remaining paratypes in the collections of the authors.

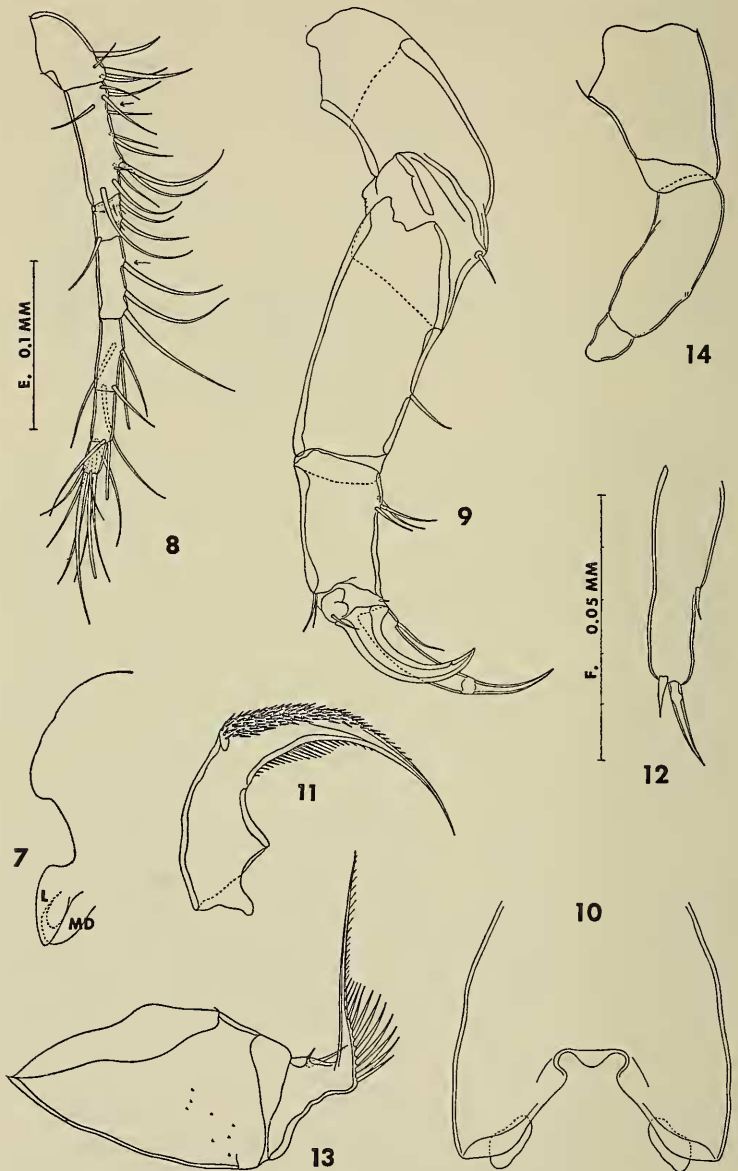
Other specimens (all from *Styela plicata*): 2 ♀♀ (USNM Acc. No. 186261), Alligator Harbor, Florida, 10 April 1950, collected by H. J. Humm; 1 ♀, 4 ♂♂, and 1 copepodid (USNM Acc. No. 187438), Alligator Harbor, Florida, 16 December 1950, collected by H. J. Humm; 2 ♀♀, 1 ♂ (USNM Acc. No. 189912), Institute of Fisheries Pier, Bogue Sound, Morehead City, North Carolina, 14 February 1951, collected by W. H. Sutcliffe, Jr.; and 2 ♀♀, 1 ♂, Florida, purchased from the Marine Biological Laboratory, Woods Hole, 4 April 1954.

Female: Body (Figs. 1, 2) moderately elongated and thinly sclerotized, with prosome not unusually thickened. Length (excluding setae on caudal rami) 1.14 mm (1.05-1.29 mm) and the greatest width 0.42 mm (0.41-0.46 mm), based on ten specimens in lactic acid. Segment of leg 1 separated from cephalosome by a dorsal transverse furrow. Epimeral areas of segment of legs 2-4 rounded. Ratio of length to width of prosome 1.56 : 1. Ratio of length of prosome to that of urosome 1.49 : 1.

Segment of leg 5 (Fig. 3) $52 \times 130 \mu$. Between this segment and genital segment no ventral intersegmental sclerite. Genital segment somewhat pyriform in dorsal view, $169 \times 156 \mu$. Areas of attachment of egg sacs located dorsolaterally near middle of segment. Each area (Fig. 4) bearing two setae 30μ and 18μ , with a minute spiniform process between them. Three postgenital segments $55 \times 57 \mu$, $39 \times 47 \mu$, and $36 \times 53 \mu$ from anterior to posterior. Posteroventral border of anal segment smooth.



FIGS. 1-6. *Henicoxiphium redactum* new genus, new species. Female: 1, Dorsal, with egg sacs and six spermatophores attached (A). 2, Lateral (A). 3, Urosome, dorsal (B). 4, Area of attachment of egg sac, dorsal (C). 5, Caudal ramus, dorsal (D). 6, Median area of cephalosome, ventral (B).



FIGS. 7-14. *Henicoxiphium redactum* new genus, new species. Female: 7, Outline of rostrum and labrum, lateral (B). 8, First antenna, dorsal (E). 9, Second antenna, anterior (C). 10, Labrum and parag-

Caudal ramus (Fig. 5) elongated, $143 \times 27 \mu$ in greatest dimensions, or 5.3 times longer than wide. All six setae relatively short and naked. Outer lateral seta and dorsal seta placed proximally at about one-third length of ramus.

Body surface bearing a few hairs (sensilla) as indicated in the figures.

Egg sac (Fig. 1) elongated, $440 \times 165 \mu$, reaching well beyond caudal rami, and containing numerous eggs about 56μ in diameter (though often of irregular form).

Rostrum (Fig. 6) seen in ventral view as a linguiform lobe, but in lateral view (Fig. 7) as a ventrally protruding area.

First antenna (Fig. 8) 7-segmented and 259μ long. Lengths of segments (measured along their posterior non-setiferous margins): 14 (44μ along anterior margin), 66, 20, 44, 39, 28, and 18μ respectively. Formula for armature: 4, 13, 6, 3, $4 + 1$ aesthete, $2 + 1$ aesthete, and $7 + 1$ aesthete. All setae naked.

Second antenna (Fig. 9) 3-segmented. First and second segments bearing a small naked inner seta. Third segment (probably result of fusion of two original segments) bearing a proximal inner group of three naked setae; distally carrying a recurved claw 42μ along its axis, a claw-like element 61μ long which has an accessory seta, and four small setae.

Labrum (Figs. 6, 10) almost cordiform in ventral view, and in lateral view (Fig. 7) abruptly set off anteriorly from postrostral region. Its two posteroventral lobes widely divergent.

Mandible (Fig. 11) having a slender blade without an indentation. Lash bearing a row of slender spinules along its concave margin and its convex surface carrying numerous shorter spinules. Paragnath (Fig. 10) a weakly sclerotized lobe without hairs. First maxilla (Fig. 12) a slender elongated segment with three elements. Second maxilla (Fig. 13) 2-segmented. Large first segment bearing a few minute outer surficial spines. Second segment, with concave ventral edge, having two small naked dorsal elements and its long lash, spinulose along one edge, placed at about a 90° angle to segment. Maxilliped (Fig. 14) 3-segmented and devoid of armature except for two extremely small (2μ) vestigial setae on second segment.

Ventral area between maxillipeds and first pair of legs (Fig. 6) somewhat protuberant (Fig. 2). A line connecting bases of maxillipeds.

Legs 1-4 (Figs. 15-18) with 3-segmented rami. Spine and setal formula as follows:

P ₁	coxa	0-1	basis	1-0	exp	I-0;	I-1;	III,I,4
					enp	0-1;	0-1;	I,5

←

naths, ventral (C). 11, Mandible, anterior (C). 12, First maxilla, posterior (F). 13, Second maxilla, outer (C). 14, Maxilliped, antero-inner (C).

P ₂	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
					enp	0-1; 0-2; I,II,3
P ₃	coxa	0-1	basis	1-0	exp	I-0; I-1; III,I,5
					enp	0-1; 0-2; I,II,2
P ₄	coxa	0-1	basis	1-0	exp	I-0; I-1; II,I,5
					enp	0-1; 0-1; I

Inner coxal seta of legs 1-3 long and plumose, but in leg 4 shorter (17 μ) and naked. Inner margin of basis of leg 1 bearing a row of several minute spines, but in legs 2-4 with a row of hairs. Spines on rami with smooth lamellae, except for outer spine on last segment of endopod of legs 1-3 which is naked. Exopod of leg 4 128 μ long. Endopod of this leg 74 μ , with its third segment $24 \times 13 \mu$ (in one endopod of a single female $19 \times 13 \mu$), and its terminal spine 44 μ . A certain amount of variability in the armature observed in leg 1 (where the right exopod in one female was I-0; I-1; II,I,4) and in leg 2 (where the left endopod in one female was 0-1; 0-1; I,II,3 and in another female 0-1; 0-3; I,II,3).

Leg 5 (Fig. 19) with free segment $34 \times 16 \mu$ in greatest dimensions, having a smaller inner terminal lobe but without fine ornamentation. Two terminal setae very unequal, the longer 28 μ , the shorter 5 μ and without a distinct articulation. All setae naked.

Leg 6 represented by the two setae near attachment of each egg sac (Fig. 4).

Color in life unknown.

Male: Body form (Fig. 20) resembling that of female. Length (without ramal setae) 0.90 mm (0.85-0.99 mm) and greatest width 0.27 mm (0.26-0.30 mm), based on ten specimens in lactic acid. Ratio of length to width of prosome 1.74 : 1. Ratio of length of prosome to that of urosome 1.17 : 1.

Segment of leg 5 (Fig. 21) $34 \times 92 \mu$. No ventral intersegmental sclerite. Genital segment $135 \times 130 \mu$. Four postgenital segments $41 \times 55 \mu$, $41 \times 44 \mu$, $27 \times 39 \mu$, and $27 \times 42 \mu$ from anterior to posterior.

Caudal ramus resembling that of female, but smaller, $126 \times 21 \mu$, or six times longer than wide.

Body surface with a few hairs as in female.

Rostrum like that of female.

First antenna similar to that of female, but two aesthetes added (at locations indicated by arrows in Fig. 8), so that formula is: 4, 13 + 1 aesthete, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna also resembling that of female, but with a few short spinules along outer margin of second segment.

Labrum, mandible, paragnath, first maxilla, and second maxilla like those of female. Maxilliped (Fig. 22) 4-segmented (assuming that proximal part of claw represents a fourth segment). First and third segments unarmed. Second segment bearing only a single naked seta (instead of two elements as in most related genera). Slender claw 97 μ along its axis, lacking a terminal lamella, with a weak division about midway

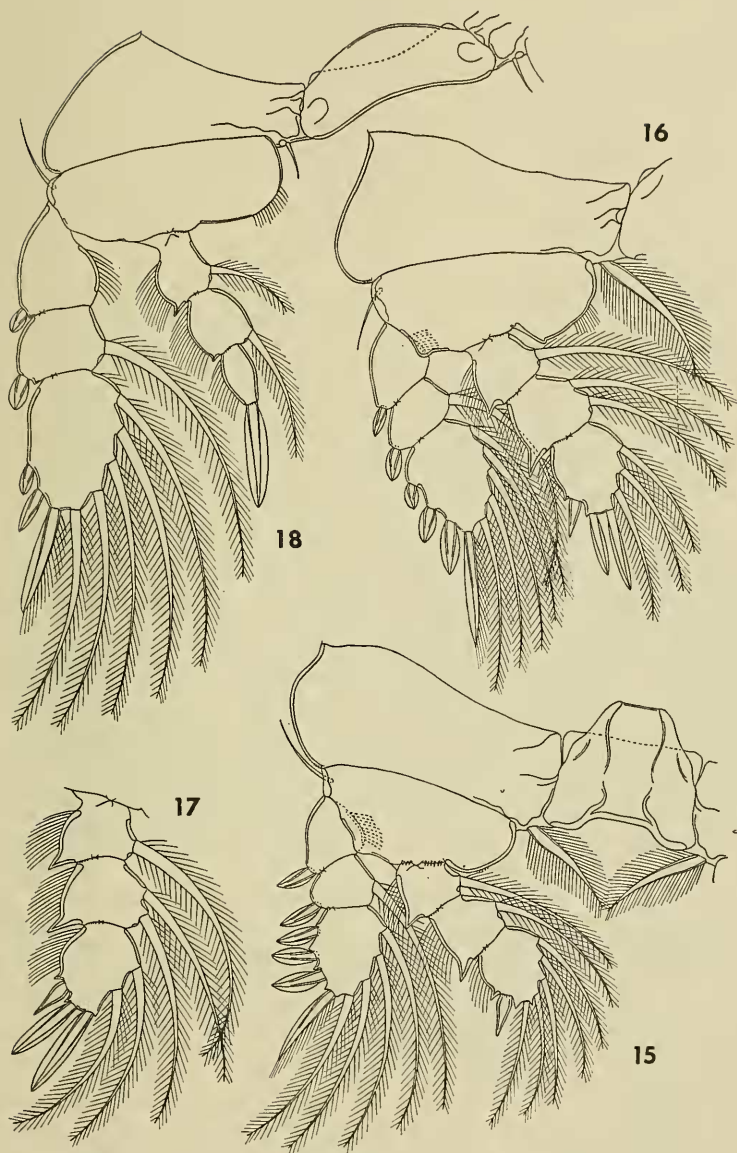
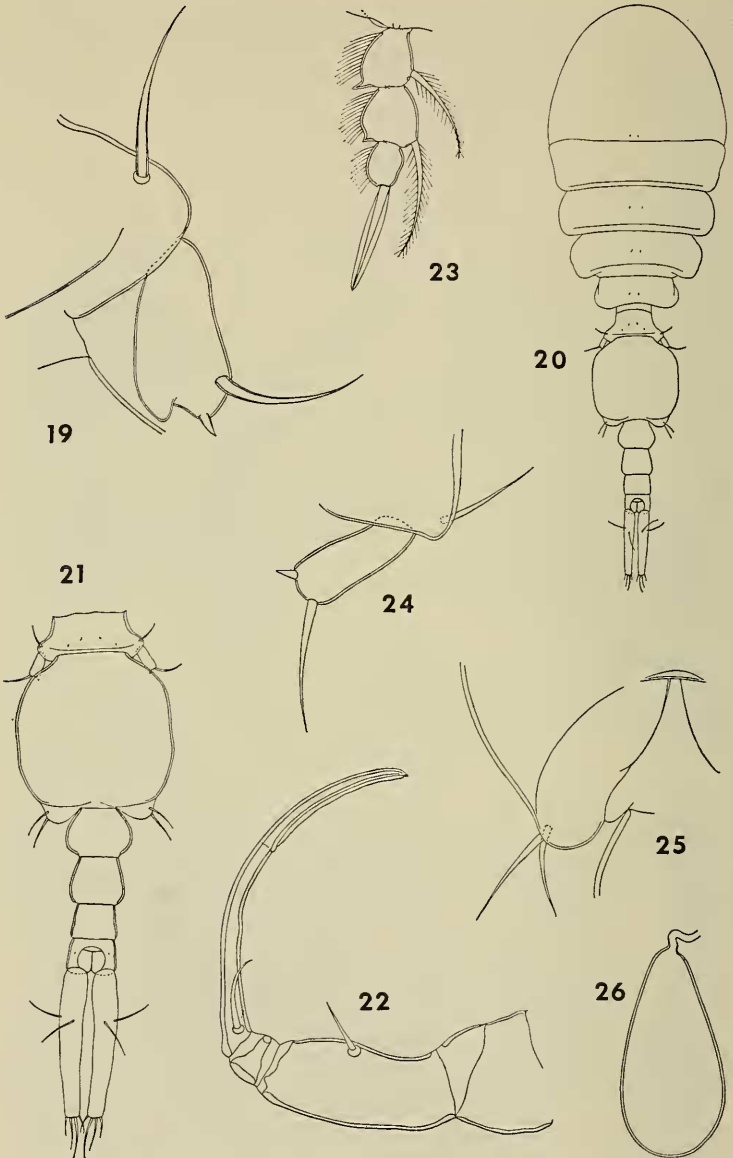


FIG. 15-18. *Henicoxiphium redactum* new genus, new species. Female: 15, Leg 1 and intercoxal plate, anterior (D). 16, Leg 2, anterior (D). 17, Endopod of leg 3, anterior (D). 18, Leg 4 and intercoxal plate, anterior (D).



FIGS 19-26. *Henicoxiphium redactum* new genus, new species. Female: 19, Leg 5, dorsal (F). Male: 20, Dorsal (A). 21, Urosome, dorsal (B). 22, Maxilliped, postero-inner (C). 23, Endopod of leg 4, anterior (C). 24, Leg 5, ventral (F). 25, Leg 6, ventral (C). 26, Spermatophore, attached to female, dorsal (B).

beyond which there is an inner fringelike lamella, and bearing two very unequal proximal naked setae.

Ventral area between maxillipeds and first pair of legs like that in female.

Legs 1-4 segmented and armed as in female. Third segment of endopod of leg 4 (Fig. 23) $13 \times 10 \mu$, shorter than in female, with its spine 34μ .

Leg 5 (Fig. 24) with free segment $23 \times 9 \mu$, without the inner terminal lobe seen in female, but with the two setae very unequal as in that sex.

Leg 6 (Fig. 25) a posteroventral flap on genital segment bearing two naked setae, both about 28μ .

Spermatophore (Figs. 1, 26) elongated and shaped like a teardrop, $92 \times 44 \mu$, not including the neck.

Color in life unknown.

Etymology: The specific name *redactum*, Latin = reduced, refers to the reduction of the armature on the maxillipeds of both sexes, to the very short terminal seta on leg 5, and to the relatively short setae on the caudal ramus.

Remarks: *Henicoxiphium* appears to be related to *Paranthesius* Claus, 1889 (taken in the broad sense, as in the work of Illg, 1949) and to *Modiolicola* Aurivillius, 1882. There are important differences, however, between *Henicoxiphium* and these two genera. In *Paranthesius* the second antenna is 4-segmented with one terminal claw, there is a single row of spinules on the convex side of the mandible, and the endopod of leg 4 has the formula 0-1; 0-1; II (in *P. anemoniae* Claus, 1889, and *P. panopeae* Illg, 1949, the formula is 0-1; 0-1; II, I). In *Modiolicola* the second antenna is 4-segmented and bears three terminal claws, the mandible has a single row of spinules on the convex side, the last segment of the endopod of leg 3 has the formula II, II, 2 or I, III, 2, and the armature of the endopod of leg 4 is 0-1; 0-1; II.

LITERATURE CITED

- ILLG, P. L. 1949. A review of the copepod genus *Paranthesius* Claus. Proc. U.S. Nat. Mus., 99 (3245): 391-428.